

TWO NEW SUBSPECIES OF THE *PAPILIO INDRA* COMPLEX FROM CALIFORNIA (PAPILIONIDAE)

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ABSTRACT. Two new subspecies of *Papilio indra* Reakirt are described from California. *P. i. phyllisae* is a large, widebanded subspecies from the southern Sierra Nevada, and is most closely related to *P. i. indra* populations of the central and northern Sierra Nevada; the foodplant is *Tauschia parishii*. *P. i. panamintensis*, a subspecies of the Death Valley region, has its closest affinity to *P. i. martini* of the Providence Mountains, California, and to unnamed *P. indra* segregates in southern Nevada; its foodplant is *Lomatium parryi*.

Within the state of California, geographically isolated populations of *Papilio indra* Reakirt have evolved into a number of distinctive subspecies. Over the past seventeen years, the author has sampled a large number of these populations, and an overall pattern of subspeciation has been delineated. Two distinctive segregates, one occurring in the southern Sierra Nevada and the other in the mountains of the Death Valley region, were found to be unassignable to any of the named subspecies of *P. indra* and are described below.

Papilio indra phyllisae, new subspecies

(Figs. 3-4)

Description. Male. Head, thorax as in typical *P. indra*. Abdomen black with a broad yellow lateral band. Forewing length, 35-47 mm. Tail length, 3-6 mm. Primaries, dorsal surface. Wing more elongated than typical *indra*; ground color jet black; submarginal spots pale yellow, and larger and more rounded than typical *indra*; post-median row of arrowhead-shaped markings pale yellow, and wider than typical *indra*, often twice as wide; pale yellow bars at distal end of discal cell similar in size and shape to typical *indra*. Secondaries, dorsal surface: Wing more elongated than in typical *indra*; ground color jet black; submarginal spots pale yellow, and more prominent than in typical *indra*; post-median band pale yellow, and wider than typical *indra*, often twice as wide; pattern of blue scaling and anal eyespot similar to typical *indra*. Primaries and secondaries, ventral surface: Similar to dorsal surface, except that light markings are cream and slightly larger. **Female.** Head, thorax, abdomen, wing shape, and color pattern as in male. Forewing length, 41-48 mm. Tail length, 3-7 mm.

Types. Holotype male: Butterbread Peak and ridge running to the southwest, 4900-5900', Kern Co., California, S. 30 & S. 31, T. 29 S., R. 36 E.; ovum collected 16 May 1978 and reared to adult; adult emerged 23 March 1979. **Allotype female:** Locality data same as for holotype; larva collected 29 June 1974 and reared to adult; adult emerged 27 May 1975. **Paratypes:** 16 ♂♂, 14 ♀♀, same locality as holotype, collected as ova and larvae on 29 June 1974, 18 May 1976, 12 May 1977, 16 May 1978, and 7 May 1980, and reared to adults; adult emergence dates May 1975 to June 1980. 8 ♂♂, summit of Butterbread Peak, 5900', Kern Co., California, 19 May 1973; 2 ♂♂, same locality, 18 May 1976. All specimens collected by J. F. Emmel.

Deposition of type material. The holotype, allotype, and 30 paratypes will be deposited in the collection of the Natural History Museum of Los Angeles Co., Los

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Angeles, California. One pair of paratypes will be deposited in each of the following collections: California Academy of Sciences, San Francisco; San Diego Natural History Museum, San Diego, California; Allyn Museum of Entomology, Sarasota, Florida; U.S. National Museum, Washington, D.C.; American Museum of Natural History, New York.

Type locality. Butterbread Peak is also spelled Butterbredt Peak on some maps. The peak is part of the extreme southern end of the Sierra Nevada, and is located about 22 airline miles northeast of the town of Tehachapi. The vegetation on the slopes of the peak consists largely of sparse Joshua Tree (*Yucca brevifolia* Engelm. in Wats.) and Juniper (*Juniperus californica* Carr.) Woodland with *Eriogonum fasciculatum* Benth., *Atriplex canescens* (Pursh) Nutt., and *Tauschia parishii* (C. & R.) Macbr.

Additional specimens examined. (All CALIFORNIA) KERN Co.: 1 ♂, Piute Peak summit, 3 July 1972; 4 ♂♂, Piute Mountain summit, 8–9 June 1974; both records leg. Jim Brock (Brock collection). TULARE Co.: 2 ♀♀, Xyz Creek, 6200', 19–26 June 1951, leg. Chris Henne & Charles Ingham (Los Angeles County Museum). INYO Co.: ova on *Tauschia parishii*, Carroll Creek, 5800', 16 June 1976, leg. James Haney (Haney collection); 2 ♂♂, Cottonwood Creek, 5300', 28 May 1970, leg. Charles Hogue (L. A. Co. Museum).

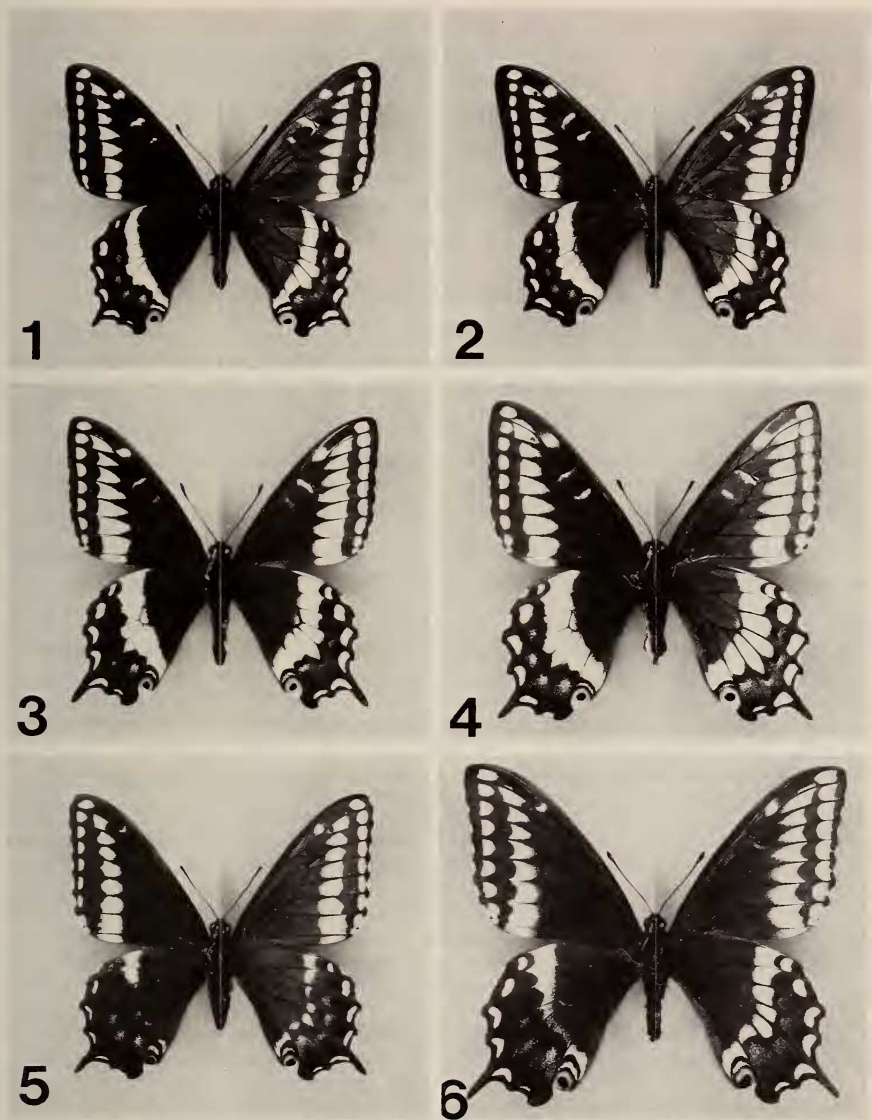
Etymology. I take great pleasure in naming this subspecies after my wife, Phyllis P. Emmel, who has provided abundant support and encouragement for my studies of the *P. indra* complex.

Geographic Range, Phenology, and Life History Notes

This distinctive subspecies is found from the Piute Mountains and extreme southern Sierra Nevada of Kern Co. north to the upper Kern River drainage of Tulare Co. and along the east slope of the Sierra Nevada in Inyo Co. as far north as Whitney Portal. Emergence of adults begins in late April or early May and continues through early June. A small second brood emerges in July in most years. The apparent sole foodplant of *P. i. phyllisae* is *Tauschia parishii*, a large apiaceous species found in the California mountains from the southern Sierra Nevada to San Diego Co. The fifth-instar larvae of *phyllisae* are bright pink with black transverse bands and transverse rows of orange dots. The color pattern of the fourth-instar larvae in particular is distinctive from all other *P. indra* subspecies. The early stages will be described in detail in a separate paper.

Remarks

P. i. phyllisae superficially resembles *P. i. nevadensis* Emmel & Emmel (1971), which is also a large, somewhat broad-banded subspecies. Detailed studies of *nevadensis* and other southern Great Basin *P. indra* populations (J. F. Emmel & Bruce Griffin, unpublished data) indicate that *nevadensis* is most closely related to an unnamed set of *indra* populations in southern Nevada. Larvae and adults of these *indra* from central and southern Nevada show a closer affinity to *P. i. minori* Cross, *P. i. kaibabensis* Bauer, and *P. i. martini* Emmel & Emmel (Emmel & Emmel, 1964, 1967, & 1968) than to nominate *P. indra*. *P. i. phyllisae*, in contrast, is most closely related to *P. i. indra* of the central and northern Sierra Nevada. This assessment is



FIGS. 1-6. Adults of *P. indra*; left half of each figure shows dorsal surface, right half shows ventral surface. 1-2, *P. i. indra*, male (1), female (2); COLORADO: Boulder Co.; Lefthand Canyon, ex ova from female taken 10 June 1972 by Don Eff. 3-4, *P. i. phyllisae*, new subspecies, holotype male (3) and allotype female (4). 5-6, *P. i. pan-amintensis*, new subspecies, holotype male (5) and allotype female (6).

based on the similarity of the immature stages of the two subspecies and on the existence of occasional *phyllisae-indra* intermediates in *P. i. indra* populations just north of the range of typical *phyllisae*. It is of interest to note that the range of *phyllisae* correlates well with the known range of *Tauschia parishii* in the southern Sierra Nevada, while typical *indra* is confined to the known range of its host, *Pteryxia terebinthina* (Hook.) Coult. & Rose, in the central and northern Sierra Nevada; the ranges of the two foodplants do not overlap (Munz, 1963).

***Papilio indra panamintensis*, new subspecies**

(Figs. 5-6)

Description. Male. Head, thorax as in *P. i. indra*. Abdomen black, with a virtual absence of yellow scaling in most specimens; when yellow scaling is present, it occurs as a small patch laterally on the eighth abdominal segment. Forewing length, 37-41 mm. Tail length, 3-5 mm. Primaries, dorsal surface: Wing more elongated than typical *indra*; ground color jet black; submarginal spots pale yellow, more prominent than in typical *indra*, and tending to retain their crescent shape; post-median row of pale yellow markings slightly wider than in typical *indra*, and tending to be round or oval rather than arrowhead-shaped; medial apices of post-median spots sprinkled with black scales; distal end of discal cell totally lacking the pale yellow bars which are present in typical *indra*. Secondaries, dorsal surface: Wing more elongated than in typical *indra*; ground color jet black; pale yellow submarginal spots similar to or less prominent than in typical *indra*; pale yellow post-median band of same width as typical *indra* in two cells nearest costal margin, but posteriorly this band rapidly becomes obsolescent or absent; pattern of blue scaling and anal eyespot similar to typical *indra*, but blue scales reduced in number. Primaries and secondaries, ventral surface: Similar to dorsal surface, although light markings are cream and somewhat more extensive. **Female.** Head, thorax, abdomen, wing shape, and color pattern as in male. Forewing length, 42-50 mm. Tail length, 4-7 mm.

Types. Holotype male: Thorndike Campground, Wildrose Canyon, 7400', Panamint Range, Inyo Co., California, S. 35, T. 19 S., R. 45 E.; larva collected 16 June 1974 and reared to adult; adult emerged 24 May 1975. **Allotype female:** Locality data same as for holotype; larva collected 20 June 1976 and reared to adult; adult emerged 5 June 1977. **Paratypes:** (All Inyo Co., California) 1 ♂, 4 ♀♀, same locality as holotype, larvae collected 16 June 1974 and 20 June 1976 and reared to adults; adult emergence dates June 1975 to May 1977. 2 ♂♂, 1 ♀, Water Canyon, 7200', above Surprise Canyon, Panamint Range, S. 2, T. 21 S., R. 45 E.; ova and larvae collected 15 June 1974 and reared to adults; adult emergence dates June 1975. 1 ♂, Rogers Peak summit, 9994', Panamint Range, S. 3, T. 20 S., R. 45 E., 10 July 1978. All of the above leg. J. F. Emmel. 1 ♂, summit of Telescope Peak, 11,049', Panamint Range, 25 May 1974, leg. Steve Bellinger. 1 ♂, Mahogany Flat, 8143', Panamint Range, 25 May 1974, leg. James Wells. 1 ♂, Mahogany Flat, 8300', 11 August 1974, leg. James Wells.

Deposition of type material. The holotype, allotype, and 9 paratypes will be deposited in the Natural History Museum of Los Angeles Co., Los Angeles, California. Three paratypes (the last three listed under Types) are in the National Park Service collection at Park Headquarters, Death Valley National Monument, Death Valley, California.

Type locality. Wildrose Canyon is a large canyon on the west slope of the Panamint Range in the Death Valley region of Inyo Co. Thorndike Campground is located in the upper part of this canyon at the 7400-foot contour. The vegetation in the type locality is Pinyon-Juniper Woodland with *Artemisia tridentata* Nutt., *Cercocarpus ledifolius* Nutt., *Cowania mexicana* D. Don var. *stansburiana* (Torr.) Jeps., *Eriogonum umbellatum* Torr. var. *subaridum* Munz, and *Lomatium parryi* (Wats.) Macbr.

Additional specimens examined. (All Inyo Co., California) 1 ♂, Tin Mountain summit, 8953', Cottonwood Mountains, 2 July 1979, leg. J. F. Emmel & O. Shields (Emmel collection). 1 ♂, Last Chance Spring, Last Chance Range, 5600', S. 2, T. 8 S., R. 39 E.; larva collected 27 May 1974 and reared to adult; adult emerged 2 June 1975; leg. J. F. Emmel (Emmel collection). 1 ♂, ridge above Last Chance Spring, 7000', Last Chance Range, 21 June 1977, leg. Derham Giuliani (Emmel collection).

Etymology. The subspecies is named after the greater Panamint Range which forms the entire western side of Death Valley. This range includes, besides the Panamint Range proper, the Cottonwood Mountains and the Last Chance Range to the north.

Geographic Range, Phenology, and Life History Notes

Populations of *P. i. panamintensis* are known from the Panamint Range, Cottonwood Mountains, and Last Chance Range in Inyo Co., California. *P. indra* larvae recently collected by the author in the Grapevine Mountains and Nopah Range, Inyo Co., also probably represent this subspecies. Emergence of adults takes place in May and early June, with a peak flight in late May. A small second brood flies in late July and early August in years of above-average winter rainfall. The sole foodplant is *Lomatium parryi* (Apiaceae), which ranges from eastern California to Nevada, Utah, and extreme northern Arizona. The early stages of *panamintensis*, to be described in detail in a separate paper, closely resemble those of *P. i. martini* and the unnamed southern Nevada *P. indra* segregates.

Remarks

This subspecies appears to be most closely related to *P. i. martini* of the Providence Mountains, San Bernardino Co., California. Important points of distinction are as follows: The wings in *panamintensis* have a deep, jet black ground color, whereas in *martini* the ground color is dull black; the light markings on the wings are pale yellow in *panamintensis* and cream in *martini*; the forewing post-median row of markings is much narrower in *martini*, often obsolescent; whereas, it is well-developed in *panamintensis*; the submarginal spots on both wings are reduced in *martini* and usually enlarged in *panamintensis*; the blue scaling on the hindwing is more prominent in *martini* than in *panamintensis*.

P. i. panamintensis was first taken by Stan Dvorak, who collected a male specimen on Telescope Peak in the Panamint Range on 9 May 1970. Subsequently, specimens were collected in May 1974 by James Wells and Steve Bellingier in the Panamint Range, and by the author in the Last Chance Range. It is remarkable that no earlier specimens are known, in view of the fact that the Panamints have been fairly frequently collected by California lepidopterists since the mid-1930's.

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